FOREST PRODUCTS LABORATORY † FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

*.4S213 Power

SMALL SAWMLL IMPROVEMENT

PRACTICAL POINTERS TO FIELD AGENCIES

EFFICIENT USE OF POWER ON THE HEADSAW

Experienced small sawmill operators will find it profitable to make the following simple checkup on how efficiently power is being used:

1. Count the number of teeth in the headsaw.
2. Find the number of inches feed averaged per revolution.
3. Divide the number of teeth in the saw by the inches traveled per revolution.

This gives the number of teeth used per inch of feed travel. If more than 10 or 12 teeth per inch are customarily used in an 8-inch face, the output can be increased by decreasing the saw speed and increasing the feed rate. The reduction in saw speed should approximate in percentage the number of teeth used per inch of feed, 20 percent if 20 teeth are used, 30 percent for 30 teeth, etc. Thus, the speed of a saw operated at 550 r.p.m. and taking 20 teeth per inch on the 8-inch face should be reduced 20 percent or to 440 r.p.m.; if 30 teeth per inch, reduce 30 percent or to 385 r.p.m. It is assumed that the engine is running at its efficient speed; do not cut down engine speed as this cuts down horsepower. Instead, increase the diameter of the driven pulley on the mandrel, by using the rule that the diameter of the drive pulley times its r.p.m. = the diameter of the driven pulley times its r.p.m. Example: To get 440 r.p.m. on the saw when the 9-inch drive pulley on the engine runs at 1000 r.p.m., multiply 9 x 1000 and divide by 440 which gives a driven pulley of about 20-1/2 inches in diameter. A reduction in saw speed may require a retensioning of the saw. No change in the feed mechanism is ordinarily required as most small mills are geared to give more than 4 inches of feed per revolution. However, by reducing the saw speed, more feed per revolution becomes possible, and this should approximate 4 inches per revolution in the cut.

The inches traveled per revolution should be taken on an 8-inch board near the center section. Measure to the nearest 1/16 inch, placing the ruler parallel with the edge of the board. In dividing the number of teeth in the saw by the inches traveled per revolution, use sixteenths. For example, suppose that the saw has 42 teeth and travels 1-13/16 inches, then divide 42 by 29/16 simply by multiplying 42 by 16 and dividing by 29 which gives about 23 teeth per inch of feed.

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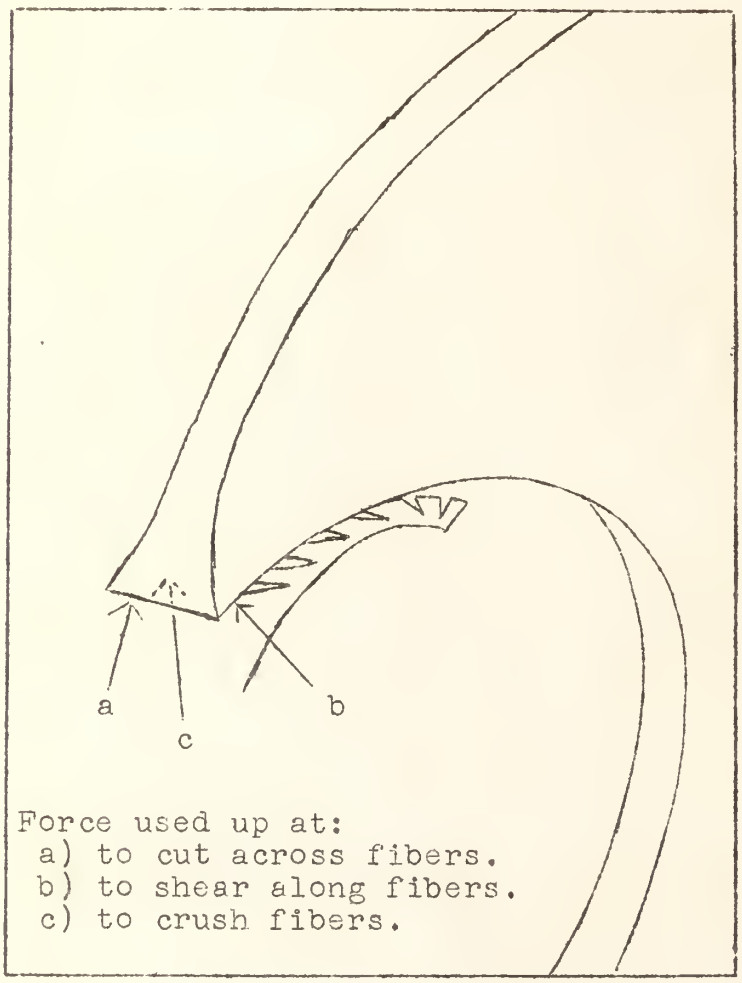
† Maintained at Madison, Wisconsin in cooperation with the University of Wisconsin

*See outline in Small Sawmill Improvement Working Plan, March 1930, for explanation of indexing system proposed

The explanation of why most mills can cut more lumber by slowing down the saw speed appears to be that force is used up in sawing chiefly at the cutting edge of the teeth to cut across the fibers, along the sides of the teeth to shear along the fibers, and just back of the cutting edge under the point to crush the fibers so that they crumble into sawdust (fig.).



Force used up at:
a) to cut across fibers.
b) to shear along fibers.
c) to crush fibers.

The force used at the cutting edge is the same for a thin chip or bite as for a thick one, and normally exceeds that used along the sides and under the point. By doubling the chip thickness the force required is increased but not doubled. Doubling the chip thickness by running the saw at half its original speed gives the same cutting rate through the log as would original speed at half chip thickness, but less power is required for the thick chip. This spare power can be utilized to increase the feed rate, resulting in a faster cutting rate through the log, hence greater production. Furthermore, the thicker chip means a correspondingly greater production before teeth need sharpening and the slower running saw is less sensitive to the shocks of sawing.

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